Delta-Sigma Modulated Photodetection Method to Reduce Laser Power

Completed Technology Project (2013 - 2014)

Project Introduction

The objective of the project is to examine a method for increasing the effectiveness of the photodetector by processing the small photodetector current rather than converting the signal to a relatively large voltage suitable for application to an analog-to-digital converter. The concept presents the potential to lower the laser power required, minimize data acquisition and data storage needs, and conduct "real-time" data interpretation.

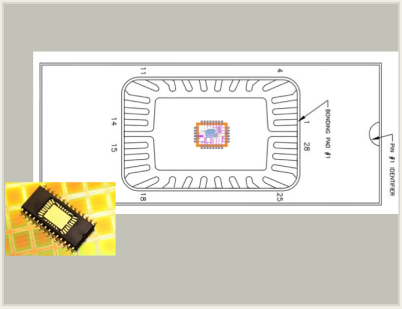
This delta-sigma technique may be thought of as a form of analog-to-digital converter (ADC). The proposed network offers a means of processing electronic signals from transducers directly into a form of digital representation. By using integrated circuit methodologies, it is expected that very small signals can be measured more accurately than the more usual discrete-evel methods (ie: using discrete parts and printed circuit boards). In this particular study, these techniques are applied to photodetectors. By maintaining the quality of signals in the lower end of the dynamic range, a successful implementation will allow the use of smaller lasers (or further detection range for the same laser power) for a given application while implementing the receiving electronics in a much smaller and lower power package.

Anticipated Benefits

The successful implementation is not constrained to laser/photodetector systems - the methodology may be applied to most low level electronic measurement systems. The developed system replaces one or more printed circuit boards and can be incorporated into "systems" as a discrete part.

Methodology is implemented as integrated circuit (IC). The successful project is focused towards weaker signals allowing some combination of lower transmitting power and longer detection range. The smaller volume and power requirements of the IC permits incorporation into "small-sat" projects. Decreased computational overhead allows lower data transmission bandwidth and decreases time necessary for data reduction and interpretation.

Dedicated and adaptable unit decreases design time for various applications. Finished unit is adaptable to most low signal level transducers. Significantly smaller package and lower power decreases physical receive electronics footprint. Can significantly reduce computational overhead and data transmission bandwidth



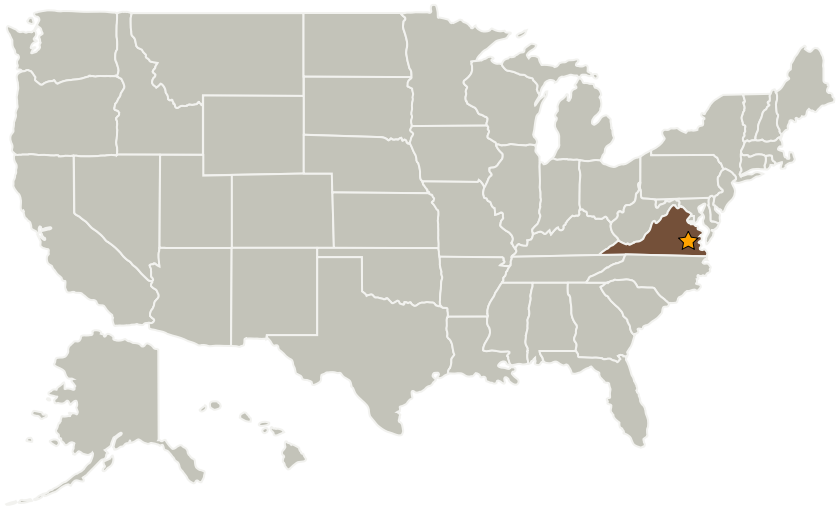
Project Image Delta-Sigma Modulated Photodetection Method to Reduce Laser Power

Table of Contents

Delta-Sigma Modulated Photodetection Method to Reduce Laser Power

Completed Technology Project (2013 - 2014)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Center Independent Research & Development: LaRC IRAD

Project Management

Program Manager:

Julie A Williams-byrd

Project Manager:

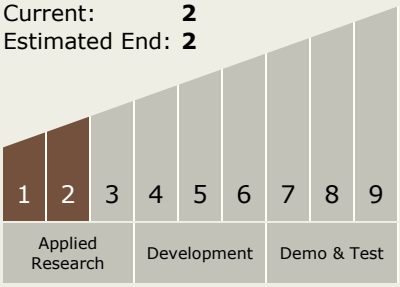
Thomas D Mcglone

Principal Investigator:

Thomas D Mcglone

Technology Maturity (TRL)

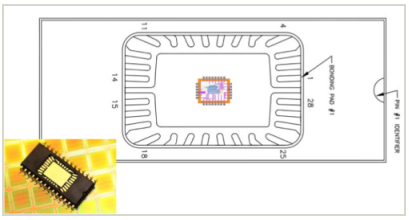
Start: **1**
Current: **2**
Estimated End: **2**



Delta-Sigma Modulated Photodetection Method to Reduce Laser Power

Completed Technology Project (2013 - 2014)

Images



12026-1378758099512.png
Project Image Delta-Sigma Modulated Photodetection Method to Reduce Laser Power
(https://techport.nasa.gov/image/2279)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.2 Electronics